

Claims

What is claimed is:

1. A method for decoding a linear block encoded string of information bits comprising the steps of:
  - a. converting the string of information bits into a plurality of codewords, wherein each codeword has a length  $N$ ;
  - b. performing hard and soft decisions on each codeword in order to generate a hard decision vector  $h$  of length  $N$  and a soft decision vector  $c$  of length  $N$ ;
  - c. computing the syndrome of the hard decision vector  $h$  by using Galois Field Arithmetic;
  - d. finding the location of the two minimum values in the soft decision vector by the Galois Field Arithmetic and designating these locations as LOW1 and LOW2,
  - e. xoring the LOW1 and LOW2 with a  $Nc1$  bit locations, wherein a  $Nc2$  bit location is generated
  - f. swapping the soft decision value at location  $Nc1$  with the soft decision value at location  $Nc2$  for each nearby valid codewords computed;
  - g. determining which soft decision value sum is the lowest and designate this as Min1;
  - h. designating two bit locations which created Min1 as MinA and MinB;
  - i. designating the next lowest soft value sum as Min2;
  - j. replacing the value at bit location MinA with the value of Min2 minus the current value at bit location MinA,
  - k. replacing the value at bit location MinB in the soft decision vector with the value of Min2 minus the current value at bit location MinB;
  - l. subtracting the value of Min1 from the values in all other bit locations in the soft decision vector in order to generate an output codeword; and
  - m. 2's complementing all soft values in the output codeword at bit locations which correspond with bit locations in the hard decision vector having a 0 in their location and creating the new signed soft value vector.

add  
a2